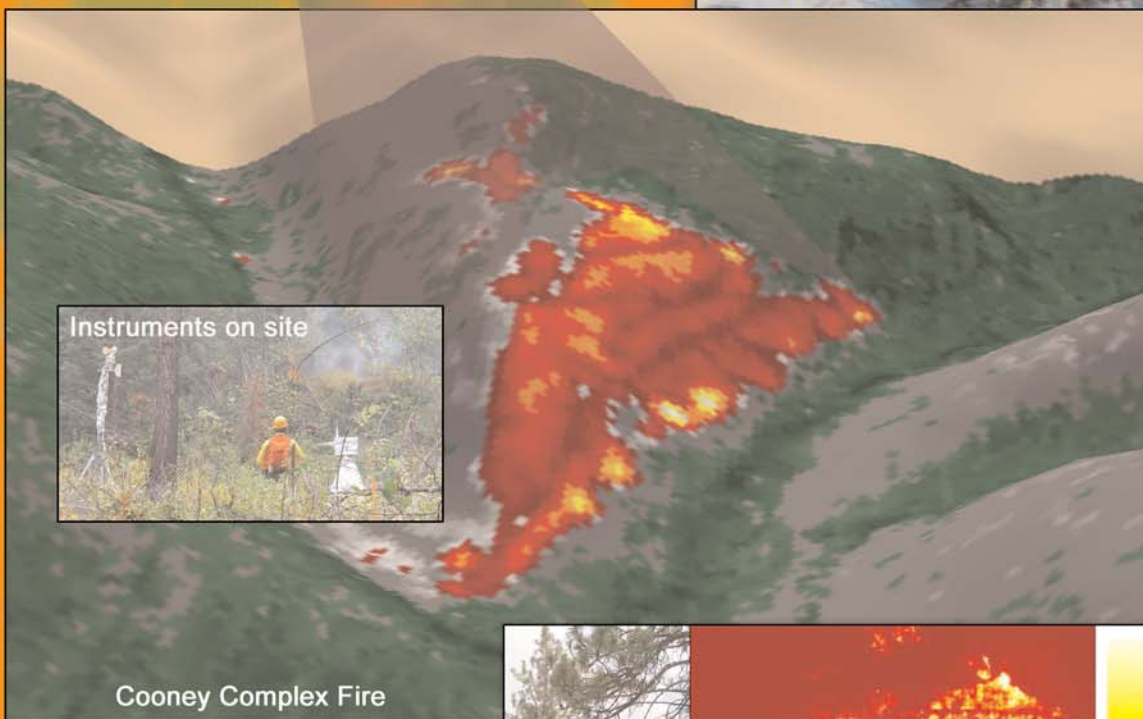
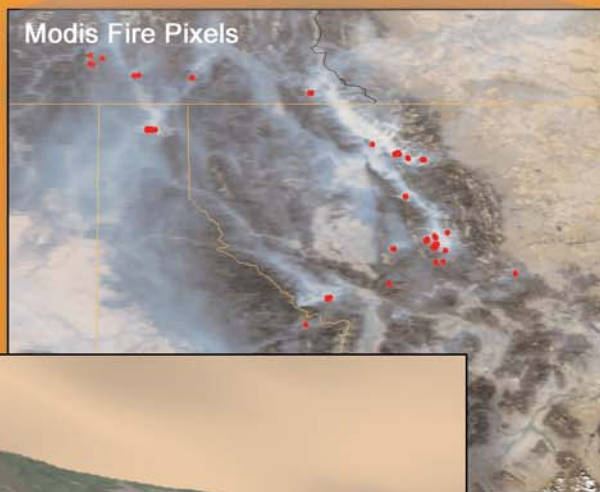




Joint Fire Science Program

2003 Business Summary



A report highlighting the accomplishments of the
Joint Fire Science Program in FY 2003

Executive Summary

The Joint Fire Science Program (JFSP) was established in FY 1998 to provide scientific information and tools in support of fuel and fire management programs. In setting priorities for funding, the program strongly emphasizes meeting the information and analysis needs of the management and policy communities, including responding to congressional direction, recommendations from a Federal Advisory Committee Act group, inputs from member agencies, and recommendations from a recent program review. All JFSP projects require scientist-manager partnerships along with strong emphasis on technology transfer. These partnerships are helping to ensure that urgent research needs at the field level are being met. Further, close collaboration among the JFSP Governing Board, National Fire Plan research coordinators, the U.S. Geological Survey, and other research scientists is helping to provide compatible and mutually beneficial products with optimum efficiency and with minimal redundancy.

The JFSP funded 23 new research projects during its inaugural year in 1998. Since then, 203 additional projects have been funded, and results from these projects are being made available to agency field offices and other users. In 2003, the JFSP funded 54 new research projects; cosponsored three wildland fire workshops at Oregon State University, the University of Arizona, and Colorado State University; completed development of an administrative database; and provided fourth-year funding for the “Fire and Fire Surrogates” project. Researchers and managers supported by the program communicated results and new tools to users through 136 published papers, 139 field trips with managers, participation in 143 workshops or symposia, 103 training sessions, the development of 35 Web pages for posting current and relevant project information, and 57 compact disks or other technology transfer media.

In 2003 JFSP—

Funded 54 new research projects

Cosponsored 3 wildland fire workshops

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- 136 published papers
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-

On the cover: Four major components of the JFSP Rapid Response study, Demonstration and Integration of Systems for Fire Remote Sensing, Ground-Based Fire Measurement, and Fire Modeling are depicted here for the Cooney Complex Fire in western Montana. The proof-of-concept study integrates September 3, 2003, “fire detect images” from MODIS (upper right satellite imagery), time-series thermal infrared measurements from aircraft (center), ground-based thermal cameras (lower-right), and newly developed in situ field instruments on the fire site (center-left). The two thermal images shown here were acquired simultaneously by aircraft and ground systems (center and lower-right, respectively) for the same study site. An ArcSDE Geodatabase and data-sharing framework is being developed to compile and integrate all research data collected.



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Introduction

Data provided by the National Interagency Fire Center in Boise, Idaho, indicate that wildland fires damaged or destroyed more than 8,000 residences, commercial buildings, and out-buildings during the 2003 fire season. More than 60,000 fires burned about 3.9 million acres—about 80 percent of the 10-year annual average—and culminated with the disastrous fires of southern California in October. Tragically, 39 firefighters and residents lost their lives. Suppression costs again exceeded \$1 billion.

Although the number of fires remains reasonably constant from year to year, the burned acreage has been double the 10-year average in 3 of the past 4 years. In addition, the current 10-year average is higher than in previous 10-year periods. Although there is debate concerning the causes, it is clear that there is a trend toward increasingly larger annual burned area. The increasing volume of fuel in many short fire-return interval

ecosystems, when combined with summer droughts, is a critical factor in the spread of wildland fires and their resistance to control. The National Fire Plan (NFP) provides impetus and funding to accelerate treatments for the reduction of fuels both in wildland areas and in the wildland-urban interface. In trying to meet NFP goals and integrate them into larger goals for land management and community protection, managers are increasingly challenged to justify treatments and to address questions concerning effects of increased levels of fuels treatment and altered fire regimes on threatened or endangered species, invasive plant species, wildlife habitat, air quality, and similar topics. The Joint Fire Science Program (JFSP) identifies the science and tools needed to address a variety of issues facing fire and fuels managers and policymakers, issues announcements for proposals, and funds research and science application projects to help answer current questions and to anticipate and address questions of the near future.

*More than
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Roger Oltmar, PNW Research Station

The Roles of Science in Managing and Resolving Wildland Fire and Fuels Issues

The Management Dilemma

Resource managers are increasingly challenged by the need to justify decisions and apply scientifically sound solutions to complex problems during the planning and implementation of on-the-ground projects. This need for science-based decisionmaking has always existed, but the demand is increasing as management agencies strive to take proactive approaches to addressing fuel problems and restoring fire-adapted ecosystems. The need for new information and tools also is increasing as treatments are applied in visible wildland-urban interface areas and across larger areas of the landscape. New issues continually arise, such as the response of invasive plant species to fuel treatments, the impacts of fuel treatments on carbon storage, the best ways of interacting with communities in the wildland-urban interface, or the impact of different degrees of landscape-level fuels treatments on wildlife habitat or on endangered or threatened plant and animal species. As researchers develop new information and tools to address these and other emerging issues, it is critical to rapidly and effectively transfer these advances to managers so that decisions can be based on the best available information.

Help From Research

The research community, including Federal, university, nonprofit organizations, and others,

recognizes the urgent need to identify and develop information and decision-support tools for addressing land management issues as quickly and efficiently as possible. Recent JFSP projects involve all the JFSP partner agencies, other Federal agencies (such as the National Aeronautics and Space Administration and U.S. Department of Agriculture, Agricultural Research Service), nearly 50 universities, State and local agencies (such as the St. John's Water Management District in Florida and the Kenai Borough in Alaska), and nonprofit groups (such as Tall Timbers Research Station and The Nature Conservancy). Several for-profit companies also have contracts to complete parts of projects. The JFSP has funded research projects or sites in 45 States, Puerto Rico, and the District of Columbia.

Joint Fire Science Program Approach

The research community is actively pursuing solutions to the problems land managers face through manager-scientist partnerships. The JFSP requires Federal agency participation in all JFSP-funded projects, and strongly encourages inclusion of land managers on the project teams. In addition, language has been added to announcements for proposals to ensure that proposals addressing local management needs are clearly responding to issues identified and initiated by local land managers. Finally, the transfer to users of information and tools developed is a required cornerstone of every JFSP-funded project.

Recent JFSP projects involve all the JFSP partner agencies, other Federal agencies, nearly 50 universities, State and local agencies, and nonprofit groups.

History of the Joint Fire Science Program

The JFSP was authorized and funded by Congress in 1998. The program is a partnership of six Federal wildland management and research agencies including the USDA Forest Service and five bureaus in the Department of the Interior: Bureau of Indian Affairs, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and U.S. Geological Survey. An appointed 10-member governing board representing the six partner agencies provides program oversight and management. Since its inception, the JFSP has issued 13 announcements for proposals, received nearly 750 proposals, and funded about 225 projects. Three additional announcement for proposals, posted on October 15, 2003, closed on December 15, 2003. Further information on the JFSP, funded projects, and outputs are available on the Internet at <http://jfsp.nifc.gov>.

Joint Fire Science Program Guidance

The JFSP works within overall program guidelines set by Congress in the annual appropriations acts for the Department of the Interior and related agencies although the JFSP predates the NFP, and the Governing Board ensures that projects it funds are supportive of, and compatible with, NFP needs. The JFSP guidance includes four original “principal purposes”—all related to wildland fuels—and subsequent guidance provided in 2001. This guidance included added emphasis on postfire stabilization and rehabilitation, aircraft-based remote sensing, “rapid response” projects to capture time-sensitive data on active or very recent wildland fires or postfire rehabilitation projects, local research needs, increased emphasis on technology transfer, and response to the NFP. Program goals and priorities are further interpreted in the JFSP plan submitted to Congress in January 1998, in internal program documents, and through discussions and input from stake-holders, including a Federal Advisory Committee Act group, agency fire directors, field managers and technical specialists, policymakers, and the science community.

*JFSP
information
is available at
<http://jfsp.nifc.gov>.*

Table 1

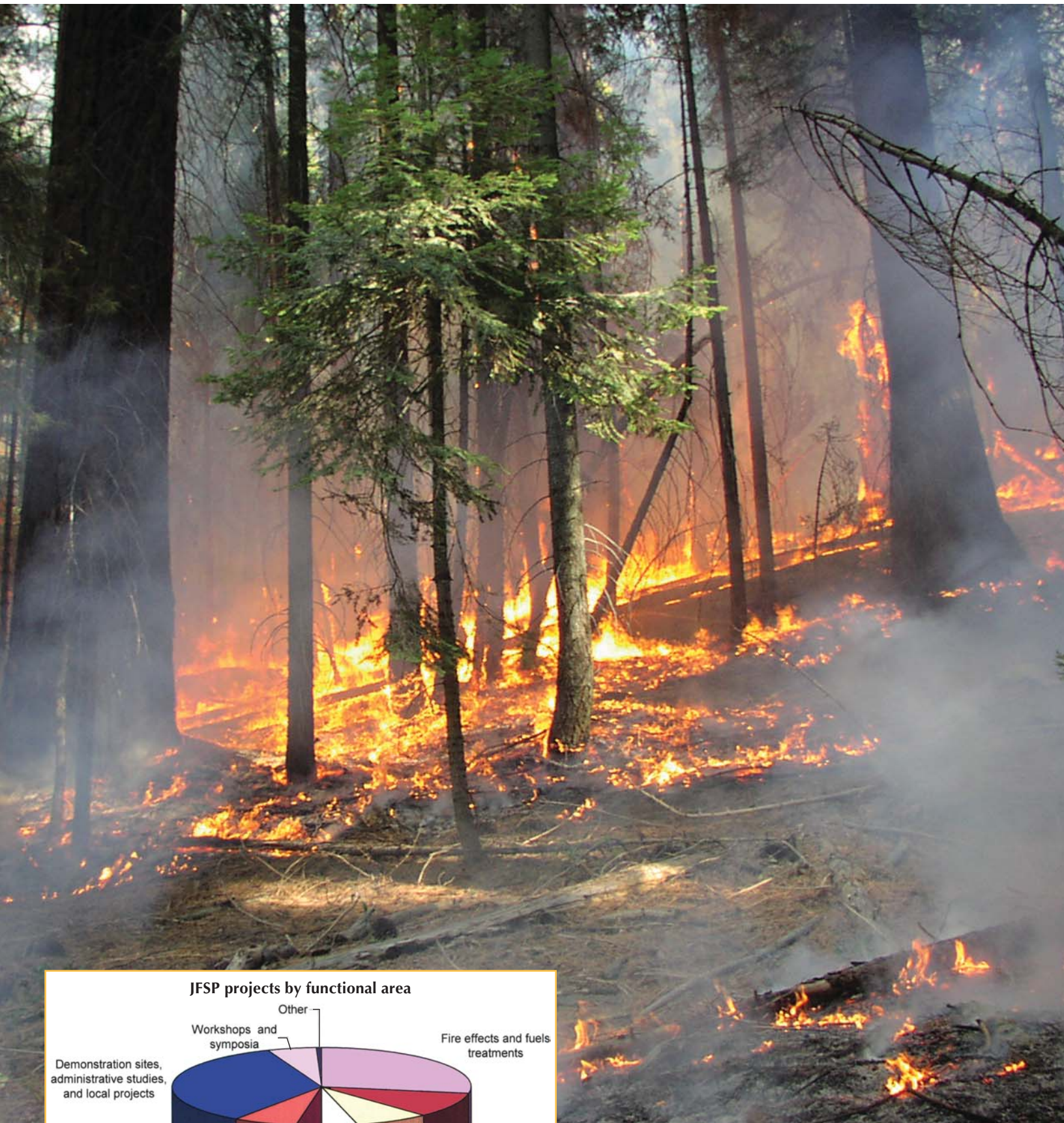
| | FY 2003 | FY 1998-2002 | Total |
|------------------------------------|---------|--------------|-------|
| Announcements for proposals issued | 4 | 9 | 13 |
| Proposals received | 254 | 496 | 750 |
| Projects funded | 54 | 172 | 226 |
| Funds obligated (millions \$) | 15.7 | 55.7 | 71.4 |

2003 Joint Fire Science Program Projects

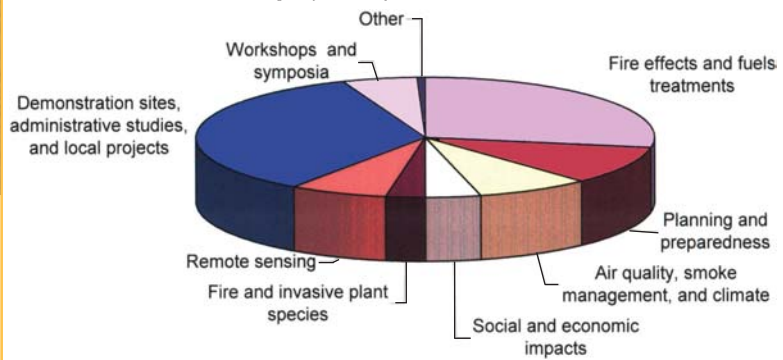
In 2003, the JFSP competitively funded 54 new research projects, 3 workshops, additional work on 1 existing project, and the fourth year of the “Fire and Fire Surrogates” project. The program also completed development of an administrative database for all JFSP-funded projects. The new research projects include support for wildland fuels management, postfire stabilization and rehabilitation, local research needs, demonstration sites, aircraft-based remote sensing, and rapid-response projects. All projects funded in 2003 directly or indirectly support the key points in the NFP. A list of 2003 projects is included in appendix A, and a complete list of all JFSP projects is included in appendix B. In addition to ongoing research, in 2003 the JFSP increased its focus on technology transfer—getting new information and tools into the hands of end users. As part of its commitment to improved science application, the governing board agreed with the recommendation of a recent program review to add a full-time technology transfer specialist to the program office. The new specialist started work in November 2003. Researchers and managers supported by the program communicated results and new tools to users through 136 published papers, 139 field trips with managers, participation in 143 workshops or symposia, 103 training sessions, the development of 35 Web pages for posting current and relevant project information, and 57 compact disks or other technology-transfer media.



Eric Knapp, PNW Research Station



JFSP projects by functional area



JFSP-funded research is producing new information and tools for use by fire and fuels managers, agency administrators, and decisionmakers.

Accomplishments

The JFSP-funded research is producing new information and tools for use by fire and fuels managers, agency administrators, and decisionmakers; and the JFSP governing board is focusing on the delivery of information and tools to end users. Areas of research include fuel consumption under various fire regimes; mitigation of postfire erosion; consequences and quantification of different levels of fire severity; relationships between insect infestations and fire behavior; relationships among weather and climate patterns and fire occurrence and severity; relationships between carbon storage, fire regimes, and fuel treatments; use of various remote sensing methods, such as light detection and ranging (LIDAR) for fuel characterization and thermal sensors for monitoring and quantifying fire behavior; and the interactions of fire with a variety of ecosystem components, including invasive plants, native flora, and native fauna. Below are brief descriptions of the above-mentioned types of research, each followed by a list of accomplishments or ongoing effort and anticipated outcomes.

Assessing the Causes, Consequences, and Spatial Variability of Burn Severity

Fire severity is variously defined but generally relates to the degree of environmental damage induced by a wildland fire. Burned Area Emergency Rehabilitation (BAER) teams and other postfire stabilization and rehabilitation specialists use estimates of severity to determine which burned areas need to be rehabilitated and which rehabilitation

methods may be successful. Recently, methods have been developed and implemented to use remotely sensed data to estimate severity. A “rapid-response” project, led by Penelope Morgan at the University of Idaho, is using a combination of field and remotely sensed data to better quantify the interactions and spatial variability in fire effects, fuels, fire behavior, and local weather and topography to assess the accuracy of current and alternative image analyses for remote sensing of burn severity.

- The project is a collaboration between the University of Idaho, Department of Forest Resources, and USDA Forest Service Rocky Mountain Research Station, Fire Sciences Laboratory.
- Five wildland fires were evaluated in 2003, and at least four additional fires will be evaluated in 2004.
- Fire behavior, fuels, and fire effects are being linked to quantitative indicators of burn severity that can be assessed in the field, predicted from fire-effects models, and mapped.
- Upon completion of the project, research and applications workshops will be conducted to share information with scientists and train applications specialists to synthesize data and recommend methods for quantitative field measurements and remote sensing of burn severity.

Using LIDAR to Identify Sediment and Forest Structure Change in the Hayman Burn, Colorado

Small-footprint multiple-return LIDAR data collected in the Cheesman Lake area prior to

the 2002 Hayman Fire in Colorado provided an excellent opportunity to evaluate LIDAR as a tool to predict and analyze fire effects on soil erosion and overstory structure. The project is led by Merrill Kaufmann of the USDA Forest Service Rocky Mountain Research Station. The approach is to use prefire and postfire imagery to (1) evaluate the effectiveness of change detection to identify and quantify areas of erosion or deposition caused by postfire rain events and rehabilitation activities, (2) identify and quantify areas of biomass loss or forest structure change resulting from the fire, and (3) examine effects of prefire fuels and vegetation structure derived from LIDAR data on patterns of burn severity.

Specific project accomplishments include—

- Compiling raw, prefire LIDAR data, and completing an automated bare-earth classification on more than 23 million points to separate detection of vegetation and bare earth.
- Using TerraScan and Microstation software, owned by the U.S. Geological Survey EROS Data Center in Sioux Falls, South Dakota, to complete the LIDAR data classification.
- Completing manual classification, following the bare-earth classification, to improve the bare-earth model and provide quality assurance and quality control of the resultant surface model.
- Creating surface flow models on the bare-earth model to identify strategic areas where erosional effects and possible sediment change may be greatest.

Results of this work are anticipated to help fire rehabilitation specialists to effectively and efficiently identify areas in need of rehabilitation following future fires.

Forest Floor Consumption and Smoke Characterization in Boreal Forest Fuelbed Types in Alaska

Many areas of the boreal forest in Alaska contain deep layers of moss, duff, and peat, resulting in a large amount of biomass that potentially can burn and smolder for long periods, while creating hazardous smoke for local residents and communities and causing detrimental impacts on the land. However, available data are inadequate to characterize smoke emissions on wildland and prescribed fires and to develop emission rate factors. Further, forest floor consumption models do not currently support these calculations. This project, led by Roger Ottmar of the USDA Forest Service Pacific Northwest Research Station was designed to remedy these shortcomings—

- Measuring forest floor consumption at five wildland fire sites on the Erickson Creek Fire along the Dalton Highway north of Fairbanks and on two sites in the Black Hills Fire on the Tetlin National Wildlife Refuge near Tok.
- Measuring forest floor consumption on the Chena Lake prescribed fire near Fairbanks.
- Collecting smoldering emission samples at the Erickson Creek Fire and Chena Lake prescribed fire.
- Inventoring two sites on the Kenai National Wildlife Refuge in preparation for burning in 2004.
- Collecting and transporting several hundred forest floor “plugs” to the USDA Forest Service Fire Sciences Laboratory in Missoula, Montana, to be burned for emission sampling under a variety of moisture and frozen layer conditions.





- Reducing and analyzing data are for inclusion in several consumption and emission models, including CONSUME, the First Order Fire Effects Model (FOFEM), and the Emission Production Model (EPM).

An Expert System and New Web Interface for Tools on the Fire Research and Management Exchange System (FRAMES)

Fire managers and research scientists have determined that existing fire management information and tools are widely scattered, and some are either unknown or inaccessible. To address this problem, a team from the University of Idaho (Penelope Morgan and Greg Gollberg), the University of Montana (Lloyd Queen), the USDA Forest Service Fire Sciences Laboratory (Bob Keane and Wayne Cook), and the USDA Forest Service Northeastern Research Station in Burlington, Vermont (Mark Twery), is developing a Web site that will manage and be a gateway to an array of tools and information.

Specifically, the project has—

- Secured a domain name and developed a Web site at <http://www.frames.gov>.
- Set up a contract with Iota Systems for computer hardware and Web server maintenance, Web and database design, and related programming.
- Established an agreement with the host institution (University of Idaho) for delivery of Internet services.
- Installed FRAMES version 1.0 and is developing version 2.0. Version 2.0 will focus on the FRAMES Content Management System, and a model has been developed by using stable and proven open-source technologies such as Apache HTTP Server, Red Hat Linux, a hypertext preprocessor, the Reiser file system, and extensible markup language. These technologies, in combination, create a fast and flexible model for storing diverse data on a variety of computer platforms.
- Formed a collaborative partnership with the developers of the U.S. Geological Survey's National Biological Information Infrastructure.

Ecosystem Responses to a High-Severity Wildfire: A Serendipitous Opportunity to Enhance the Fire and Fire Surrogates Study

Research opportunities often occur unexpectedly, and this project is one such case. A large, ongoing project, known as the Fire and Fire Surrogates study, is occurring on 13 sites around the United States. Coincidentally, scientists working at the Lake Fork site in the Jemez Mountains of New Mexico had collected a significant amount of data in preparation for installing study treatments. The site was burned unexpectedly in the August 2002 Lake Complex Fire, which made it unsuitable for completing the Fire and Fire Surrogates study. However, because of the large volume of high-quality data that had been collected, the site became immediately useful for determining and documenting the effects of the fire on vegetation, soil properties, and microbial populations and processes. Led by Steve Overby of the USDA Forest Service Rocky Mountain Research Station, this project has—

- Resampled vegetation in the original fire and fire surrogates study blocks.

- Established in situ soil mineralization cores.
- Conducted additional soil sampling for total carbon, total nitrogen, total phosphorus, pH, enzymes, potential nitrification, microbial biomass, phospho-lipid fatty acids, and community-level physiological profiles.
- Established soil resin cores to provide an annual nitrogen flux.
- Analyzed and prepared data so that they can be included in the Fire and Fire Surrogates study meta-analysis.

Field Measurements for the Training and Validation of Burn Severity Maps from Spaceborne, Remotely Sensed Imagery

Satellite imagery is a rapidly available, unbiased, repeatable, and scientifically defensible source of information for mapping. However, without “ground truthing,” the accuracy of these maps is controversial. This project, led by Tom Bobbe of the USDA Forest Service Remote Sensing Applications Center collected georeferenced field data pertaining to burn severity and postfire vegetation condition to refine and validate imagery-based maps of burn severity. Operational aspects of this work are supported by BAER funding.

Accomplishments include—

- Collecting more than 200 field observations from 6 wildland fires in 4 States.
- Providing burned area reflectance classifications to BAER teams.
- Providing on-incident geospatial support for the fires where the observations were collected.
- Supporting more than 110 incidents in 2002 and 2003.



Preliminary results indicate that the highest accuracies were obtained on high-severity and unburned areas (70 to 85 percent), and lowest accuracies were in the low- and moderate- burn severity classes.

Photo Series for Major Natural Fuel Types of the United States–Phase II

“Photo series” are collections of high-quality stereo-pair photographs representing various fuel loadings in various ecosystems. The photo series are developed by following a rigorous scientific protocol, and a large volume of reference data accompanies each photo pair. The photo series is a rapid and accurate tool for fire and fuels managers to estimate fuel loading, by size class, for use in planning prescribed fires, predicting fire behavior on wildland fires, and for related purposes. During the past several decades, photo series have been



developed for a number of ecosystems or fuel types. They are widely used operationally and for training. The JFSP has supported the development of photo series for additional fuel types. Photo series for eight fuel types are being developed in this project, led by Roger Ottmar of the USDA Forest Service Pacific Northwest Research Station, including aspen and birch in Alaska; hardwood/conifer mix in Tennessee and Georgia; jack pine in Wisconsin, Minnesota, and Michigan; mixed conifer with shrub understory in Oregon; oak savanna in California, Oregon, and Washington; tree sand hills in Florida; sand pine scrub in Florida and Georgia; and palmetto and marsh grass in Florida.

Accomplishments include—

- Printing and distributing Lake States jack pine photo series.
- Printing and distributing Alaska hardwood photo series.
- Digitizing and enhancing photo series photos and color to represent new fire behavior fuel models being developed by the USDA Forest Service Fire Sciences Laboratory.
- Publishing two proceedings papers.
- Completing a photo series training package and including it in a fire training course (RX 410).

Wildland Fire in Ecosystems: Effects of Fire on Air

A series of five fire-effects publications, colloquially known as the “Rainbow Series,” is in progress. The series, when completed, will

include the effects of fire on (1) fauna, (2) flora, (3) cultural resources and archaeology, (4) soil and water, and (5) air. The fauna and flora volumes were previously completed. A team led by Dave Sandberg completed the air volume in 2003. The air volume is a current synthesis of the known effects of fire and smoke on air quality. The Rainbow Series volumes are useful for policymakers, land managers, and others needing an understanding of the effects of fires. Although local examples are included to illustrate points, the general approach of the series is process oriented so that readers can make inferences about different situations and locations. The air volume is available on the Web at http://www.fs.fed.us/rm/pubs/rmrs_gtr42_5.html. The fauna and flora volumes can be accessed at http://www.fs.fed.us/rm/pubs/rmrs_gtr42_1.html and http://www.fs.fed.us/rm/pubs/rmrs_gtr42_2.html, respectively. Instructions for ordering copies of the publications are included on the Web pages.

Assessing Anthropogenic Changes in Fire Regimes by Using Relict Areas in El Malpais National Monument, New Mexico

It is difficult to “restore” ecosystems without a historical reference. This project, led by Henri Grissino-Mayer and graduate student Daniel Lewis at the University of Tennessee, investigated the fire history of five minimally disturbed kipukas (islands of vegetation developed on an old lava flow surrounded by newer flows) and three adjacent lava flow sites in the El Malpais National Monument. These types of relict areas are commonly used

for such studies. The focus was on spatial and temporal changes that have occurred since European-American settlement circa 1880. In addition, age structure analyses were used to examine changes in the age structure of ponderosa pine forests on two kipukas, Mesita Blanca and Hidden Kipuka.

Weibull Fire Intervals ranged from 3 to 43 years. The maximum hazard interval for all sites combined was 20 years. The maximum was recently exceeded because the last major fire to occur in the sample area was in 1976.

Fire history analysis also indicated that fire regimes of the kipukas were altered beginning in the early 1930s, when widespread fire suppression techniques were applied to adjacent lava flow areas.

Project participants—

- Sampled 8 sites and collected and analyzed 105 fire-scarred samples.
- Took increment cores from living ponderosa pine trees on two kipukas to examine the age structure of the kipuka forests and to determine whether fire suppression away from the kipukas may be allowing the pines to encroach onto areas not in their local distribution in the monument.
- Determined that (1) wildfire occurrences were common prior to 1880, (2) widespread wildfires ceased after about 1880, (3) wildfires were largely uncommon by about 1933, and (4) the age cohorts of trees indicated that even remote locations such as isolated kipukas may be experiencing the adverse effects of successful fire exclusion in the 20th century.

Prefire Fuel Manipulation Impacts on Alien Plant Invasion of Wildlands

One risk of wildland fuel treatments is often the unknown impact of the treatments on possible subsequent invasion of the site by weeds. This project, led by Jon Keeley and Kyle Merriam of the U.S. Geological Survey, Western Ecological Research Center in Three Rivers, California, focuses on the relationship between invasive plants and treatments in wildland fuel breaks and defensible fuel-reduction zones. These areas, selected to represent diverse fuel types, include shrublands, woodlands, and conifer forests. The work is being done on Federal and State lands and local jurisdictions throughout California and includes—

- Collecting data on 24 fuel-reduction treatment areas across California. (for example, fuel breaks, shaded fuel breaks, and firelines in a variety of plant communities, such as chaparral, oak woodland, and coniferous forests).
- Presenting preliminary results to all cooperators and other interested audiences, including the California Native Plant Society, Sierra Nevada Science Symposium, the Ecological Society of America, and Weed Science Society of America.
- Compiling for analysis a 10,000-record database of plant species composition and topographic, environmental, and anthropogenic variables.



Research and Application Highlights

FIREMON: Fire Effects Monitoring and Inventory System

Background: Monitoring the effects of wildland fire is critical for documenting fire effects, assessing ecosystem damage and benefit, evaluating the success or failure of a treatment, and appraising the potential for future treatments. Monitoring fire effects is often difficult because data collection and analysis can require a significant commitment of time and funding. More significantly, agency employees/units may not have scientifically based, standardized protocols for inventorying prefire and postfire or treatment conditions and analysis tools that result in consistent approaches to monitoring and evaluation.

Approach: The research team for this project consulted with managers in designing a comprehensive monitoring system called FIREMON that is designed to satisfy the needs of most fire management agencies in the United States for information on ecosystem effects of wildland fire and fuel treatments. Major goals of the FIREMON project were to develop a system that allowed consistent and comprehensive sampling of fire effects so data can be evaluated for significant impacts, shared across agencies, and used to update and refine fire management plans and prescriptions.

Accomplishments: The FIREMON application is available for use online at <http://fire.org/firemon>. FIREMON consists of four main components: (1) integrated sampling strategy, which provides guidance on how to select an appropriate monitoring approach; (2) descriptions of a number of sampling methods that allow users to assess many ecosystem attributes; (3) common data storage in the Microsoft Access-based FIREMON database; and (4) an analysis tools package that can summarize data across a number of plots by any stratification and provide



Duncan Lutes, RMRS, Fire Laboratory

for statistical comparison of remeasured plots by using a standard t-test method. Text and graphical reports also can be imported into documents by using standard cut-and-paste commands. The analysis tools package also converts fuels data into files suitable for use in the Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS).

Application: To promote the transfer of this technology, a FIREMON user's workshop was held in Missoula, Montana, in May 2003, with representatives from the U.S. Fish and Wildlife Service, U.S. Department of the Interior Bureau of Land Management, USDA Forest Service, as well as students from the University of Montana. In addition to hands-on training with FIREMON, participants received outdoor training in applying each of the FIREMON monitoring methods. Since then, the U.S. Department of the Interior Bureau of Indian Affairs selected FIREMON as its fire monitoring package and has trained personnel from the Fire Education Corps, Student Cooperative Association, in the sampling of fuels treatments on wildland-urban interface (WUI) lands on the Flathead Indian Reservation.

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Research and Application Highlights

A Risk-Based Comparison of Potential Fuels-Treatment Tradeoff Models

Background: A variety of computer models are available for evaluating the potential effects of various wildland fuels treatments. However, there is little information to aid users in deciding which model is most appropriate for use at different locations and under different scenarios. The purpose of this project is to make head-to-head comparisons of several of the models (Fire Effects Tradeoff Model or FETM, Vegetation Disturbance Dynamics Tool or VDDT, and **SIM**ulating **P**rocesses and **P**atterns at Landscape **s**ca**L**Es/**M**ultiresource **A**nalysis and **G**eographic **I**nformation System or **SIMP**PLE/**M**AGIS) so that users will have sound reasons for selecting the most appropriate model for wildland fire and fuels management planning.

Approach: The models being compared have different information requirements, and therefore, extra pains are being taken to collect and evaluate data to ensure that the models receive a fair test and that the results are comparable. A variety of sites are being used to compare the models, including sites in Alaska, Alabama, California, Florida, Michigan, New Mexico, Montana, and Utah.

The scope of the project has recently been increased by expanding the area of the Kenai, Alaska, site from the originally planned 333,000 acres to nearly 1,400,000 acres so that a majority of the spruce bark beetle infestation area could be included in the comparison. Also, the area to be included for two eastern longleaf pine sites has been expanded to include private inholdings.



Roger Ottmar, PNW Research Station

Accomplishments:

- Completed fuel treatment scenarios on six of eight sites.
- Expanded study sites were on the Alaska site and two Southeastern sites.
- Discovered the importance of accurate determination of fire frequency, as well as description of vegetation succession, through sensitivity analysis of the three models on the Angeles National Forest.
- Identified differences between models with respect to simulation of fire disturbance through historical retrospective performed at Yosemite National park.

Application: All three models are being used to evaluate fire management plan options for the Angeles National Forest in California.

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Research and Application Highlights

Stand-Replacement Prescribed Burning for Fuel Reduction and Regeneration of Table Mountain/Pitch Pine Stands in the Southern Appalachian Mountains

Background: Until recently, prescribed fire has had limited application in the Appalachian Mountains because of the perceived risk of damaging hardwoods and inability to control fire intensity on steep slopes. Two tree species, Table Mountain pine and pitch pine, are thought to be at least partially fire dependent because they have serotinous cones, seedlings are highly intolerant of shade, and seedling establishment is thought to be best where fires completely remove the duff layer. The purpose of this project is to determine whether stand-replacement fires can or should be used to regenerate these two pine species.

Approach: Researchers investigated effects of prescribed fires and wildfires of various intensities on overstory mortality, forest floor, pine seedling establishment and survival, and response of potential competing vegetation. Greenhouse and field experiments evaluated the effects of shading and duff thickness on pine seedling survival.

Accomplishments: High-intensity and medium-to-high-intensity fires killed most overstory trees and provided adequate sunlight for pine seedlings. Low-intensity and medium-to-low-intensity fires did not kill overstory trees,

and left too much shade on the forest floor. Sufficient seedling densities to restore pine-dominated stands occurred after all but the highest intensity fires. Many seedlings survived the first growing season as their roots penetrated residual duff to reach mineral soil. Hardwood rootstocks sprouted on sites treated with all fire intensities and may eventually out-compete pine seedlings.

Previous research suggested that high-intensity fires would result in adequate pine seedling establishment; however, this did not occur. Greenhouse and field experiments confirmed that pine seedlings had better survival in the presence of low shade and thin duff than in full sunlight and with no duff. These results suggest that high-intensity fires reduce seedbed habitat quality by drying the site. High-intensity fires also reduced mycorrhizal abundance and, therefore, limited moisture availability for germinants. Poor regeneration after high-intensity fires was not likely caused by an inadequate prefire seed source. Rather, the fires may have consumed cones or killed the seed.

Application: Either single fires of relatively high-intensity or multiple low-intensity fires can achieve successful regeneration of ridgetop pine communities, but crown fires are too hot and will potentially damage the site. Medium-to-high-intensity fires, which reach into the lower crowns of pines, are safer and provide abundant regeneration. Multiple low-intensity fires require a greater investment of time but better mimic historical burning regimes. This knowledge will allow a wider burning window and increase worker safety because severe weather conditions are not required for low-intensity fires.



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Contact:

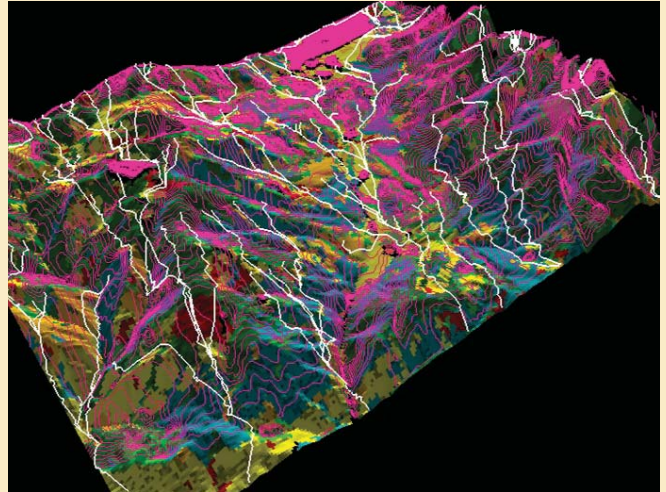
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Research and Application Highlights

Cumulative Effects of Fuel Management on Landscape-Scale Fire Behavior and Effects

Background: Wildland fire and fuel managers need to be able to determine the proper location of fuels treatment projects to obtain the optimum results for disrupting large fire growth. That is, where are the best locations to install treatments and how should they be configured in order to significantly reduce fire size and spread? Because combinations of prescribed fire and thinning are typically applied in discrete units of hundreds or thousands of acres, and wildland fires are often much larger compared with the practical sizes and numbers of such fuel treatments, the pattern and location of treatment units across a landscape has important bearing on their effectiveness and efficiency in changing fire growth and behavior.

Approach: This project used graph theory methods to assess fire growth and behavior. Gridded spatial data describing two fuel conditions (current and desired), topography, and target environmental conditions (fuel moisture content and wind) under which the fuel treatments are intended to be effective were used. Fire behavior values were then computed for each fuel condition on all areas on the landscape, including forward rate of fire spread, intensity, and elliptical fire shape dimensions. Fire growth was computed by using a minimum time algorithm to obtain spatial data on travel time with current fuel conditions.



Mark Finney, RMRS, Fire Science Complex

Accomplishments: Results of the analyses indicate that patterns of installing fuels treatments on the landscape have a dramatic effect on fire rates of spread and therefore on fire size. Model results suggest that strategic placement of fuel treatments on a landscape can greatly decrease the area that needs to be treated to achieve landscape fire management objectives.

Application: Treatment patterns derived from FlamMap, a spatial fire behavior calculation program, have been used successfully in a local study in Utah. The Boundary Waters Canoe Area in Minnesota is being incorporated into FlamMap (<http://fire.org/nav.mas?pages=flammap&mode=1>).

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Research and Application Highlights

Development of a Landscape-Scale Framework for Interagency Wildland Fuels Management Planning

Background: Traditionally, wildland fuels management planning across jurisdictions has been constrained by agency-specific goals and procedures. This approach has prevented effective, interagency, landscape-scale fuels management planning and implementation. The purpose of this project was to develop a landscape-scale, interagency approach to fuels management.

Approach: The southern Sierra Nevada area project team consisted of representatives of Sequoia and Kings Canyon National Parks, Sequoia National Forest, and the Bakersfield District of the Bureau of Land Management. The team systematically designed and developed an interagency collaborative framework for identifying and treating fuels across the landscape. The project area included six major watersheds and a large diversity of vegetation and fuel types covering about 4.8 million acres in the southern Sierra Nevada Range of California. The project retained focus on improving firefighter and public safety, reducing costs, and achieving ecological and hazard-reduction goals across jurisdictional boundaries.

Accomplishments: Among the products are—

- Seamless geospatial data sets across the entire project area with fully compliant metadata.
- Continuous access to data and analyses via a Web-based (<http://ssgic.cr.usgs.gov>), mapping delivery system.
- Collaborative analytical procedures and methods for defining and assessing risk, hazard, and values across the entire project area.
- A geographic information system (GIS) software tool, Asset Analyzer, for comparing, analyzing, and prioritizing fuels treatments.
- Collaborative identification of areas that are highest priority for treatment.
- Written protocols and guidelines to facilitate use in other geographic areas.

Application: Results of this project are currently being used by the developers to plan and implement wildland fuels treatment projects, and the process is readily available for use in other geographic areas. For example, the process was used by the agencies in 2003 to cooperatively manage “wildland fire use” fires on more than 7,000 acres under the jurisdiction of the USDA Forest Service and National Park Service.

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Research and Application Highlights

Development of a Computer Model for Management of Fuels, Human–Fire Interactions, and Wildland Fires in the Boreal Forest of Alaska

Background: Interior Alaska contains about 140 million burnable acres and includes the largest national parks and national wildlife refuges in the United States. Approximately 1 million acres burn each year, threatening the lives, property, and timber resources of Alaska's sparse but growing human population. Federal and State fire and land managers in Alaska are concerned with integrating fire management activities around human settlements with multidecade maintenance of natural ecosystems.

Approach: This project is developing a computer-based, fire-management modeling tool that is consistent with ecological processes in the boreal forest of interior Alaska. The model will depict the responses of vegetation to multiple scenarios of fire management, fuel buildup, and climate change. Model outputs will be transient depictions of vegetation, fuel, and fire extent over defined landscapes.

A fieldwork phase of the project includes stand age analyses of forests representing the five major boreal forest fuel types. It is anticipated that, over time, the abundance of these fuel types in specific areas will change, so age-dependent, hazard-of-burning functions are being developed for each fuel type. These functions will yield the first well-quantified and geographically representative estimates of fire frequencies over the past several centuries in interior Alaska. The fieldwork is taking place along a climatic gradient stretching across interior Alaska.

Accomplishments: More than 4,000 trees have been sampled for age and life history to provide ecological data to populate



Roger Ottmar, PNW Research Station

the model. Recent focus has been in the Sheenjek and Chandalar River drainages in northeastern Alaska, on the Yukon Flats National Wildlife Refuge, and on Venetie Native Corporation land. In addition, lake sediment coring and additional tree sampling occurred in the Nowitna area. Also, a laboratory was established at the University of Alaska, Fairbanks, to analyze tree cross sections. Finally, work is ongoing by Scott Rupp to re-parameterize the ALFRESCO global change model to an annual time step and 1-km pixel resolution, and to further develop ecological assumptions related to multiple successional pathways and fire-climate feedbacks.

Application: A prototype of the model is currently being applied by wildlife biologists as a management tool to evaluate fire-caribou habitat in the eastern Tanana Hills and Tetlin Flats areas where wintering caribou feed primarily on climax stage fruticose lichens. Wildfires typically reduce the availability of the lichens in this area. Model simulations are being used to evaluate scientific objectives relative to influences of various fire and climatic regimes on the abundance and distribution of lichens.

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Seth White, PNW Research Station

Research and Application Highlights

Wildland Fire Workshops: Bridging the Gap Between Research and Management

Background: During spring 2003, three professionally facilitated workshops were held at Oregon State University, the University of Arizona, and Colorado State University. These universities were selected because of their wildland fire science expertise and because of the proximity to three significant 2003 wildland fires: Biscuit Fire in Oregon, Rodeo-Chediski Fire in Arizona, and the Hayman Fire in Colorado.

Approach: The workshops, jointly funded by the JFSP, USDA Forest Service NFP research, and the USDA Forest Service Pacific Southwest Research Station, brought managers and research scientists together to collaboratively (1) create a prioritized list of recommendations for urgently needed wildland fire- and fuel-related research; (2) identify the characteristics of

effective partnerships; (3) identify types of effective information, tools, and processes that will lead to better management decisions; and (4) evaluate the workshops as a potential blueprint for similar workshops in other regions.

Accomplishments: Nearly 300 managers and scientists participated in the workshops. As expected, the three workshops developed somewhat different research needs and priorities. For example, the highest priorities, from the Oregon, Arizona, and Colorado workshops, respectively, were to focus on the effectiveness of various postfire rehabilitation treatments, assess fuel treatments in the context of weather and climate, and do research that incorporated the historical context of wildland fire and fuels. However, common themes also emerged, including large fire behavior and occurrence, fuels treatment strategies, postfire rehabilitation and restoration strategies, invasive species, fire-climate interactions, smoke management, fire histories, partnership approaches, wildland-urban interface issues, costs and benefits of fire, and the optimization of decisionmaking.

Application: These themes are being used to identify and develop announcements for proposals (AFPs), task statements, and similar methods of initiating research projects. For example, an October 2003 JFSP AFP included two task statements on "technology transfer," and concepts from the themes were embedded in other AFPs and task statements. The themes from the workshops are described in a workshop executive summary posted at http://www.fs.fed.us/pnw/about/programs/fsd/exec_summ072203.pdf. A comprehensive general technical report on the workshops is available from the USDA Forest Service Pacific Northwest Research Station.

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Research and Application Highlights

Demonstration and Integration of Systems for Fire Remote Sensing, Ground-Based Fire Measurement, and Fire Modeling

Background: Detailed aircraft-based remote sensing information on fire behavior shows great potential for evaluating and improving fire behavior models, as well as for providing enhanced, near real-time information on fire activity to fire managers on the ground. This project is conducting proof-of-concept research to compare airborne and ground-based fire-measurement systems, begin evaluation of two fire-behavior simulation models with these data, test approaches of incorporating improved wind-field and weather data in these models, test the utility of new airborne remote sensing applications for incident management support, and develop a geographic database architecture to facilitate sharing and integration of data.

Approach: This project, a collaborative effort between the USDA Forest Service laboratories in Riverside, California, and Missoula, Montana, Space Instruments, Inc., in San Diego, California, the Los Alamos National Laboratory in Los Alamos, New Mexico, and the Rochester Institute of Technology in Rochester, New York, is conducting research on active wildfires and prescribed fires in California, Montana, and other locations as opportunities arise. A suite of measurements and monitoring approaches are used on each fire, including installation of instruments that measure fire behavior and energy-release characteristics on the ground, high-resolution aircraft-based monitoring of fire spread and energy release, integration of this information with existing fuels data and geographic data layers, and comparison of observations with modeled landscape fire behavior.

Accomplishments: In summer 2003, combined ground-based and airborne remotely sensed measurements of wildland fire properties and behavior were made in a rapid response to the Cooney Ridge Fire in western Montana. Fire detection data obtained by using the moderate-resolution imaging spectroradiometer (MODIS) instrument were assessed for this fire, and a



Roger Ottmar, PNW Research Station

companion study being conducted by Penelope Morgan of the University of Idaho assessed the spatial distribution of fire severity on and around the sample site. Remotely sensed aircraft-based measurements of active fires in western Montana also were combined with geographic data to provide near-real-time intelligence to the multiagency coordination group and incident management teams during the 2003 Montana fires. The data also were used to initialize and calibrate simulations by the FARSITE fire behavior model under a series of weather scenarios. In addition, coordinated ground-based and airborne measurements were made on a prescribed fire at the Tenderfoot Creek Experimental Forest on the Lewis and Clark National Forest. The aircraft technology also was used to monitor the southern California fires of October 2003 and provide data on fire activity to fire operations personnel.

Application: Because of the nature of this project, the remote sensing products have been put into immediate application by incident management teams in their planning for fire incident response. Future applications will include improved understanding and validation of fire behavior models and more accurate interpretation of remotely sensed data. We anticipate expanding the project to other geographic areas and fuel types. Some training is being provided to immediate collaborators on fire incidents. In the future, training will be provided to fire managers on the benefits and uses of the new technology, and information from this project will be incorporated into fire behavior and other appropriate training courses.

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Research and Application Highlights

Risk Assessment of Fuel Management Practices on Hillslope Erosion Processes

Background: Federal agencies often apply treatments intended to stabilize or rehabilitate portions of recently burned areas to protect watersheds and reduce erosion. However, fire-induced erosion is poorly understood, and the effectiveness of many postfire erosion reduction treatments is not well documented.

Approach: To provide better information for land managers, this project is measuring soil erosion following fire, with and without mitigation treatments, to quantify the amount of erosion and evaluate the efficacy of several mitigation treatments that are in current use. Findings from this research and other

sources are being incorporated into an online erosion prediction interface (ERMiT) that incorporates variability in soils, spatial distribution of fire severity, and climate into a final prediction for single-storm and annual erosion rates in each of the first 5 years following the wildland fire.

Accomplishments: Studies, including some aspects of the work supported by USDA Forest Service NFP research and BAER Program funds, have been installed following wildfires in Arizona, California, Colorado, Montana, Utah, and Washington. The mitigation treatments being evaluated include contour-felled logs, straw mulch, and hydromulch. We now have six installations measuring the effectiveness of contour-felled logs. Analysis to date shows that they may reduce sediment output from watersheds after small or average storms but have little effect on erosion or runoff from short-duration, high-intensity rain events. Mulching treatments differ greatly in cost but can significantly reduce surface erosion under certain conditions. Initial results have provided the basis for incorporating into ERMiT the ability to readily evaluate the impacts of various levels of mulching and seeding; work is ongoing to incorporate contour-felled logs and predict the risk of dry ravel.

Application: More than 16,000 runs of the forested hillslope erosion model have been completed in support of field units. Also, a beta version of the ERMiT interface was introduced to users in 2003 and is being evaluated by BAER teams, and other rehabilitation specialists. Since May 2003, we have had 480 computer runs using ERMiT, mainly for fires in Montana, Idaho, and Arizona.

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Research and Application Highlights

Effectiveness of Postfire Seeding to Reduce Cheatgrass (*Bromus tectorum*) Growth and Reproduction in Recently Burned Sagebrush Steppe

Background: Millions of acres of the intermountain West are infested with the annual weed, cheatgrass, and several million additional acres are at risk of infestation. Cheatgrass reduces native wildlife habitat and produces other negative impacts, but more importantly, it increases susceptibility to wildland fire. Unless burned areas are stabilized and rehabilitated, the fire-cheatgrass cycle escalates. This project is addressing one aspect of the cheatgrass problem—the effectiveness of postfire treatments in reducing cheatgrass.

Approach: This project is evaluating several postfire treatments including the use of introduced vs. native seed mixes and grasses vs. grasses plus leguminous forbs. The project also is evaluating the effects of postfire soil conditions such as nutrient level and seedbank composition because these factors may influence the effectiveness of some or all postfire treatments. In addition, the effects of seeding treatments on species composition and abundance of native plants will be evaluated during the first 2 years following treatment. The findings will be presented to land managers as recommendations for consideration during the planning, design, and implementation of postfire treatments. Sites being used in this study include the nearly 23,000-acre Cannon Fire near Walker and Coleville in eastern California, and a 60-acre prescribed fire on Shivwitz



Plateau in the Lake Mead National Recreation Area portion of the Parashant National Monument in northwestern Arizona.

Accomplishments: Work on the 23,000-acre Cannon wildland fire site near Walker and Coleville in eastern California included the collection of pretreatment soil seedbank samples, installation of seeding treatments and nutrient treatments, and collection of first posttreatment plant cover samples and soil seedbank samples. Work on the Shivwitz Plateau prescribed fire treatment site included collection of pretreatment soil seedbank samples and postfire installation of seeding treatments.

Application: Managers at the Lake Mead area of the Parashant National Monument have used the preliminary findings to include a mixture of native perennial grasses in seedings to reduce the dominance of cheatgrass and other invasive plants.

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JFSP Information

Meeting the Needs of Local Managers for Fire Science Information

In the past 3 years, JFSP has funded about 75 projects to address local needs for fire and fuels management. These include establishment of demonstration sites for educating local managers and the public about the effects of fuel management treatments and studies to address local information needs on treatment effects or effectiveness, specific ecosystem effects of fires, fire regimes, and other information that may be important for

fire and land management planning. A key factor differentiating these projects from others funded by the JFSP is that they are intended to address information or public education needs identified by local managers.

Projects have been funded in all regions of the country and in many different types of ecosystems where management of fire, fire regimes, or fuels is an issue for planning.

Some examples of ongoing projects are illustrated in the table below. A full listing of funded projects is in appendix 2.



Charles Curtin, Arid Lands Project

| Region | Vegetation | Project description | Collaborators |
|------------------------|--------------|--|--|
| Pacific Coast National | Forest | Kings River and Lake Tahoe Basin demonstration sites for fuel treatments | FS—Sierra Forest (NF) |
| | | Identifying reference conditions for prescribed fire management of mixed-conifer forests in Yosemite National Park, California | National Park Service (NPS) |
| | | Effects of season and interval of prescribed burns in a ponderosa pine ecosystem, Blue Mountains | FS—Pacific Northwest Research Station |
| | | Fire regimes of forests in the peninsular and transverse ranges of southern California | FS—southern California national forests |
| | Chaparral | Fuels management and nonnative plant species: an evaluation of fire and fire surrogate treatments in a chaparral plant community | NPS—Whiskeytown National Recreation Area (NRA) |
| | | Fire hazard reduction in chaparral by using diverse treatments, southern California—comparison of prescribed fire and mechanical treatments | Bureau of Land Management (BLM); University of California, Berkeley |
| Northern Interior | Forest | Fire effects on rare flora and fauna in southern California national forests | FS—Pacific Southwest Research Station; Fish and Wildlife Service (FWS) |
| | | Impacts of prescribed burning on the survival of Douglas-fir and ponderosa pine in the Boise National Forest | FS—Boise NF |
| | | Fuels treatment demonstration sites in the boreal forests of interior Alaska | BLM—Tanana Chiefs Conference |
| | Shrub-steppe | Management of fuels and forest structure in the southern boreal forest on Minnesota's national forests | FS—Chippewa NF |
| | | Management of fuel loading in the shrub-steppe | FWS—Columbia National Wildlife Refuge (NWR) |
| | Prairie | Effects of prescribed fire on the invasion of northern mixed-grass prairie by nonnative plant species: implications for restoration of an endangered ecosystem | FWS—Des Lacs NWR Complex |

| Region | Vegetation | Project description | Collaborators |
|-------------|----------------|--|--|
| Great Basin | Pinyon-Juniper | A demonstration area on ecosystem response to watershed-scale burns in Great Basin pinyon-juniper woodlands, | FS—Humboldt-Toiyabe NF |
| | Sagebrush | Interactions of burn season and ecological condition on ecosystem response to fire in mountain big sagebrush communities | NPS—Crater Lake NP; Oregon State University |
| | Aquatic | Evaluating effects of prescribed fire and fuels treatment on water quality and aquatic habitat—effects of mechanical fuel treatments on surface erosion and sedimentation in streams | FS—Pacific Northwest Research Station, Umatilla NF |
| | Multiple | Methods for building long-term fire history in Great Basin valley landscapes | BLM—Nevada Office |
| Southwest | Forest | Two demonstration sites in northern Arizona for forest thinning, fire use, and fire-surrogate treatments in the ponderosa pine type | Nature Conservancy; FS—Coconino and Kaibab NFs |
| | Pinyon-juniper | Weed invasions following fire in southwestern Colorado: long-term effectiveness of mitigation treatments and future predictions | Prescott College; NPS—Mesa Verde NP |
| | Desert | Control of invasive annual grasses in the Mojave Desert—comparison of fire, clipping, and herbicide treatments | BLM; U.S. Geological Survey (USGS)—Western Research Center |
| East | Forest | Prescribed fires in mid-Atlantic coastal plain forests—effectiveness of treatments at reducing fuel loads, and impacts on endangered species habitat and invasive plant species. | USGS—Patuxent Research Center; FWS—Blackwater and Primehook NWRs |
| | | Changes in fire regimes and the successional status of Table Mountain pine (<i>Pinus pungens</i> Lamb.) in the southern Appalachians | University of Tennessee; NPS—Great Smoky Mountains NP |
| | | Frequency and season of prescription fires to reduce hazardous fuel loads on the lower piedmont of Georgia: establishing a demonstration area on a 12-year-old study | FS—Southern Research Station |

Stakeholder Advisory Group

The JFSP Stakeholder Advisory Group is being rechartered by the Secretaries of the Departments of Agriculture and the Interior under provisions of the Federal Advisory Committee Act. The group provides advice and recommendations on current and future research and priority research and technology transfer needs and other inputs on program focus and management to the JFSP governing board. The new 15-member group will include five Federal members representing National Aeronautical and Space Administration, the Department of Defense, the Environmental Protection Agency, the Department of Energy, and USDA Natural Resources Conservation Service. The 10 non-Federal members are expected to represent diverse groups such as State forestry organizations, private landowners, county commissioners, and universities. The group will meet annually or as needed to conduct group business.



Henri Grissino-Mayer, University of Tennessee

Conclusion

The JFSP is a dynamic program that actively seeks input from partner agencies, a Stakeholder Advisory Group, Congress, and others to determine needs and priorities, fund appropriate research projects, and ensure delivery of information and tools to end users. The diversity of participation and expertise in both the governing board and the stakeholder group help ensure that the program takes a balanced approach to setting priorities and making funding decisions. Products from JFSP projects are helping meet needs for new information and tools, and for information dissemination to users in support of science-based planning and implementation of wildland fuels treatments and related activities on lands managed by Federal agencies and cooperators. The JFSP provides a unique role in wildland fire research that is complementary to base research programs in several agencies and to NFP research in the USDA Forest Service. A newly formed interagency Fire Research Coordination Council, which has as one of its key goals the coordination of fire-related research programs across Federal agencies, will play a major role in continuing to ensure the most effective and efficient coordination of activities among the various programs.

Appendix A

Joint Fire Science Program Research Projects Funded in FY 2003

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|---|------------------------|--------------------------|
| 01C-3-3-21 | Characterizing moisture regimes for assessing fuel availability in North Carolina vegetation communities | Roberta Bartlette | rbartlette@fs.fed.us |
| 01C-3-3-22 | Fire regimes and forest structure of Utah and eastern Nevada | Emily Heyerdahl | eheyerdahl@fs.fed.us |
| 01C-3-3-25 | Fire regimes and forest reference conditions for prescribed fire management | Ellis Richard | ellis_richard@fs.fed.us |
| 03-1-1-06 | Carbon cycling at the landscape scale: the effect of changes in climate and fire frequency on age distribution, stand structure, and net ecosystem production | Michael Ryan | mgyran@fs.fed.us |
| 03-1-1-07 | Climate drivers of fire and fuel in the northern Rockies: past, present, and future | Penny Morgan | pmorgan@fs.fed.us |
| 03-1-1-08 | Modeling vegetation phenology for the assessment of present and future fire hazard potential | Pat Andrews | pandrews@fs.fed.us |
| 03-1-1-22 | Fire-climate interactions and predicting fire season severity in the mediterranean climate areas of California, southern Oregon, and western Nevada | Carl Skinner | cskinner@fs.fed.us |
| 03-1-1-37 | Atmospheric fire risk in a changed climate | Julie Winkler | winkler@msu.edu |
| 03-1-2-02 | Monitoring trust as an evaluation of the success of collaborative planning in a landscape-level fuel-hazard-reduction treatment | Alan Watson | awatson@fs.fed.us |
| 03-1-3-02 | Forecasting of fire weather and smoke by using vegetation atmosphere interactions | Karl Zeller | kzeller@fs.fed.us |
| 03-1-3-06 | Fuel consumption and flammability thresholds in shrub-dominated ecosystems | Clint Wright | cwright@fs.fed.us |
| 03-1-3-08 | Forest floor consumption and smoke characterization in boreal forest | Roger Ottmar | rottmar@fs.fed.us |
| 03-1-3-09 | Automated system for evaluating BlueSky prediction of smoke impacts on community health and ecosystems | Susan O'Neill | oneill@fs.fed.us |
| 03-1-4-09 | Patch burning on grasslands: effects on fuels, fire behavior, and fire spread | David Engle | dme@mail.pss.okstate.edu |
| 03-1-4-11 | The effects of grass seeding and salvage logging on fuel loads | Boone Kauffman | boonekauffman@fs.fed.us |
| 03-1-4-14 | Evaluation of postwildfire debris flow mitigation methods and development of decision-support tools | Susan Cannon | susan_cannon@usgs.gov |
| 03-1-4-21 | Designing an experiment to evaluate effects of fire and fire surrogate treatments in the sagebrush biome | Jim McIver | jmciver@fs.fed.us |
| 03-2-1-02 | Assessing the causes, consequences, and variability of burn severity | Pete Robichaud | probichaud@fs.fed.us |
| 03-2-1-03 | Characterization of firefighter safety zone effectiveness | Bret Butler | bwbutler@fs.fed.us |
| 03-2-1-04 | Modeling surface winds in complex terrain for wildland fire incident support | Mark Finney | mfinney@fs.fed.us |
| 03-2-2-01 | Effects of blowdown, beetle outbreak, and fire history on the behavior of 2002 Colorado fires | Tom Veblen | veblen@spot.colorado.edu |
| 03-2-3-01 | Effects of fire on Umpqua gentian | Thomas Kaye | kayet@peak.org |
| 03-2-3-05 | Ecosystem responses to high-severity wildfire | Steven Overby | goverby@fs.fed.us |
| 03-2-3-08 | Prefire condition, fire severity, and postfire effects in the Haymann burn | Merrill Kaufmann | mkaufmann@fs.fed.us |
| 03-2-3-09 | Ecosystem effects and propagation of the Biscuit fire across large-scale plots | Bernard Bormann | bbormann@fs.fed.us |
| 03-2-3-11 | Quantification of runoff and erosion on semiarid grasslands following a wildfire | Ginger Paige | gpaige@tucson.ars.ag.gov |
| 03-2-3-13 | The effects of soil properties, fuel characteristics, and vegetation recovery on postfire watershed hydrology | Pete Wohlgenuth | pwohlgenuth@fs.fed.us |
| 03-2-3-15 | Initial postfire avian response to high fire severity | Marcia Narog | mnarog@fs.fed.us |

| Project ID number | Project title | Principal investigator | E-mail address |
|--------------------------|--|-------------------------------|-------------------------------|
| 03-2-3-18 | Using LIDAR to identify sediment and forest structure change in the Hayman burn, CO | Merrill Kaufmann | mkaufmann@fs.fed.us |
| 03-2-3-20 | Effects of altering stand structure on wildfire severity and effects in the Black Mt. Experimental Forest | Martin Ritchie | mritchie@fs.fed.us |
| 03-2-3-22 | Postfire erosion and the effectiveness of emergency rehabilitation | Pete Robichaud | probichaud@fs.fed.us |
| 03-3-2-04 | Prescribed burning to protect large-diameter pine trees from wildfire | Kevin Ryan | kryan@fs.fed.us |
| 03-3-2-05 | Effects of prescribed burning on mycorrhizal fungi in Crater Lake | Kermit Cromack | kermit.cromack@orst.edu |
| 03-3-2-06 | Effects of mechanically generated slash particle size on prescribed fire behavior | Richy Harrod | rharrod@fs.fed.us |
| 03-3-2-07 | Fire effects on yuma clapper rails and California black rails on the lower Colorado River | Courtney Conway | cconway@ag.arizona.edu |
| 03-3-3-11 | Evaluating effects of fuels treatments on native flora and fauna | Yvette Ortega | yortega@fs.fed.us |
| 03-3-3-13 | Assessment of top-down and bottom-up controls on fire regimes | Ann Camp | ann.camp@yale.edu |
| 03-3-3-15 | Relationships of an alien plant, fuel dynamic, and weather on wildfires in Hawaiian rain | Rhonda Loh | rhonda_loh@nps.gov |
| 03-3-3-26 | Effects of wildland fires on buff-breasted flycatchers and other forest birds in southeastern Arizona | Courtney Conway | cconway@ag.arizona.edu |
| 03-3-3-28 | Effects of season of prescribed fire and grazing on understory plant communities in a ponderosa pine forest | Becky Kerns | bkerns@fs.fed.us |
| 03-3-3-36 | Fuels reduction in oak woodlands, shrublands, and grasslands of SW Oregon | Pat Muir | muirp@science.oregonstate.edu |
| 03-3-3-46 | Stereo photo series for quantifying natural fuels in the Prairie Forest and Northwestern Great Plains | Mitch Maycox | mmaycox@mt.blm.gov |
| 03-3-3-57 | The effects of prescribed fire season and fire surrogates on crown fire: adapted knobcone pine forests | James Dawson | jdawson@ca.blm.gov |
| 03-3-3-58 | Effects of fuel management treatments in pinyon-juniper vegetation at a site on the Colorado plateau | Matt Brooks | matt_brooks@usgs.gov |
| 03-4-1-02 | An expert system and new Web interface for tools on the fire research and management exchange system | Penny Morgan | pmorgan@fs.fed.us |
| 03-4-2-03 | Completion of invasive plant knowledge base summaries for FEIS | Jane Kapler-Smith | jsmith09@fs.fed.us |
| 03-4-2-05 | Strengthening the application of the Ventilation Climate Information System (VCIS) for multiscale planning | Sue Ferguson | sferguson@fs.fed.us |
| 03-4-2-06 | A regional information node for fire science in the Pacific Northwest | David Peterson | peterson@fs.fed.us |
| 03-4-2-08 | Geomorphic and watershed impacts of wildland fire | Tom Casadevall | tcasadev@usgs.gov |
| 03-4-2-16 | Assessing the risk of decisionmaking related to uncharacteristic wildfires: a 2003 symposium | Dave Peterson | peterson@fs.fed.us |
| 03-S-01 | Demonstration and integration of systems for fire remote sensing, ground-based fire measurement, and fire modeling | Colin Hardy/ Phil Riggan | chardy01@fs.fed.us |
| 03-S-02 | 2 nd international wildland fire ecology and fire management congress | Jim Brenner | brennej@doacs.state.fl.us |
| 03-S-03 | Workshop to develop a comprehensive approach to identify the essential elements of collaboration | Pam Jakes | pjakes@fs.fed.us |
| 03-U-01 | Symposia on fire economics, policy, and planning: a global vision | Armando Gonzalez-Caban | agonzalezcaban@fs.fed.us |

Appendix B

Joint Fire Science Program projects funded 1998-2002

| Project ID number | Project title | Principal investigator | E-mail address |
|---|---|---------------------------------|---------------------------|
| Fire Effects and Fuels Treatment Effects | | | |
| 98-S-01 * | Rainbow Series (three of five volumes finished: effects of fire on flora, effects of fire on fauna, and effects of fire on air) | Kevin Ryan | kryan@fs.fed.us |
| 98-S-02 * | Coarse-scale spatial data for wildland fire and fuels management | Colin Hardy | chardy@fs.fed.us |
| 98-1-1-05 | Photo series for major natural fuel types of the United States—Phase II (01.PNW.A.1, 01.PNW.C.1) | Roger Ottmar | rottmar@fs.fed.us |
| 98-1-1-06 | Application of a fuel characterization system for major fuel types of the contiguous United States and Alaska (01.PNW.A.2, 01.PNW.A.3, 01.PNW.C.1) | Roger Ottmar | rottmar@fs.fed.us |
| 98-1-4-02 * | Assessing values at risk in the United States from wildland fire | Douglas Rideout | doug@cnr.colostate.edu |
| 98-1-4-09 * | Stand-replacement prescribed burning for fuel reduction and regeneration of Table Mountain/pitch pine stands in the southern Appalachian Mountains | Thomas Waldrop | twaldrop@fs.fed.us |
| 98-1-4-10 | Fuels management and wildlife habitat: quantity and quality relationships | R. Bruce Bury | burryb@mail.cor.epa.gov |
| 98-1-4-12 | Risk assessment of fuel management practices on hillslope erosion processes (01.PSW.B.1, 01.RMS.C.3, 02.RMS.C.1) | Peter Robichaud | probichaud@fs.fed.us |
| 98-1-5-01 * | Fire regimes and fuel treatments: a synthesis with manager feedback (01.RMS.C.4) | Phil Omi | phil@cnr.colostate.edu |
| 98-1-5-02 | Fire ecology information for California | Neil Sugihara | nsugihara@fs.fed.us |
| 98-1-7-02 * | Adaptation of fuels and fire extension to the Forest Vegetation Simulator | Nick Crookston, | ncrookston@fs.fed.us |
| 98-1-7-04 * | Development of a flexible, standardized methodology for optimizing fuel treatment programs across space and time | Denis Dean, | denis@cnr.colostate.edu |
| 98-1-8-02 * | BehavePlus fire modeling system version 1.0.0 | Pat Andrews, | pandrews@fs.fed.us |
| 98-1-8-03 * | A national First Order Fire Effects Model (FOFEM) | Elizabeth Reinhardt, | ereinhardt@fs.fed.us |
| 99-1-1-01 * | Assessing the need, costs, and potential benefits of prescribed fire and mechanical treatments to reduce fire hazard in New Mexico and Montana | Jamie Barbour, | jbarbour@fs.fed.us |
| 99-1-3-04 * | Develop a landscape-scale framework for interagency wildland fuels management planning | Pat Lineback | pat_lineback@nps.gov |
| 99-1-3-06 * | Mechanical midstory reduction treatment: an alternative to prescribed fire | Bob Rummer | rrummer@fs.fed.us |
| 99-1-3-08 * | Spatial and temporal variation in the fire regime at Monument Canyon Research Natural Area, Santa Fe National Forest | Tom Swetnam | tswetnam@lrr.arizona.edu |
| 99-1-3-11 * | Multicentury fire modeling over landscape gradients | Peter Fule | pete.fule@nau.edu |
| 99-1-3-12 | Quantification of canopy fuels in conifer forests | Elizabeth Reinhardt | ereinhardt @fs.fed.us |
| 99-1-3-13 | Carbon and nitrogen cycling by microbial decomposers following thinning and burning in a Southwest ponderosa pine ecosystem (01.RMS.B.1) | Daniel Neary | dneary@fs.fed.us |
| 99-1-3-29 | Southern Utah fuels management demonstration project (01.RMS.A.4) | Kevin Ryan | kryan@fs.fed.us |
| 99-1-4-01 * | Effect of fuel treatments on wildfire severity | Phil Omi | phil@cnr.colostate.edu |
| 99-1-4-02 | The value of fuel management in reducing wildfire damage to overstory trees | Kenneth Outcalt | koutcalt@fs.fed.us |
| 99-1-5-04 | Historical fire regimes and changes since European settlement on the northern mixed prairie: effect on ecosystem function and fire behavior | Ron Wakimoto E. Earl Willard | wakimoto@forestry.umn.edu |

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|--|------------------------|-------------------------|
| 00-1-1-03 | Changing fire regimes, increased fuel loads, and invasive species: effects on sagebrush steppe and pinyon-juniper ecosystems (01.RMS.B.2, 01.RMS.B.5, 01.RMS.C.1) | Jeanne Chambers | jchambers@fs.fed.us |
| 00-U-01 | Cerro Grande postfire inventory and analysis (01.RMS.C.5) | Carl Edminster | cedminster@fs.fed.us |
| 01-S-06 | Additional work for quantification of canopy fuels in conifer forests | Sue Ferguson | sferguson@fs.fed.us |
| 01-1-1-02 | Development of a computer model for management of fuels, human-fire interactions, and wildland fires in the boreal forest of Alaska | Scott Rupp | srupp@lter.uaf.edu |
| 01-1-1-05 | Can wildland fire use restore historical fire regimes in wilderness and other unroaded lands? (01.RMS.A.5) | Carol Miller | cmiller04@fs.fed.us |
| 01-1-1-06 | Historical wildland fire use: lessons to be learned from 25 years of wilderness fire management (01.RMS.A.4) | Matthew Rollins | rrollins@fs.fed.us |
| 01-1-2-03 | In-woods decisionmaking of utilization opportunities to lower costs of fire hazard reduction treatments | Eini Lowell | elowell@fs.fed.us |
| 01-1-3-09 | Consequences and correlates of fire in wetlands | David Brownlie | dave_brownlie@fws.gov |
| 01-1-3-11 | Duff consumption and southern pine mortality (01.SRS.C.5) | Kevin Hiers | john.hiers@eglin.af.mil |
| 01-1-3-12 | Effects of prescribed and wildland fire on aquatic ecosystems in Western forests (01.RMS.A.5) | David Pilliod | dpilliod@usgs.gov |
| 01-1-3-19 | Effects of fuels reduction and exotic plant removal on vertebrates, vegetation, and water resources in Southwestern riparian ecosystems (01.RMS.C.8) | Deborah Finch | dfinch@fs.fed.us |
| 01-1-3-21 | Cumulative effects of fuel management on landscape-scale fire behavior and effects | Mark Finney | mfinney@fs.fed.us |
| 01-1-3-22 | Optimizing landscape treatments for reducing wildfire risk and improving ecological sustainability of ponderosa pine forests within mixed-severity fire regimes (01.RMS.A.1) | Merrill Kaufman | mkaufmann@fs.fed.us |
| 01-1-3-25 | Prescribed fire strategies to restore wildlife habitat in ponderosa pine forests of the intermountain West (01.PNW.C.2, 02.RMS.C.2) | Victoria Saab | vsaab@fs.fed.us |
| 01-1-3-27 | Developing statistical wildlife habitat relationships for assessing cumulative effects of fuels treatments | Kevin McKelvey | kmckelvey@fs.fed.us |
| 01-1-3-37 | Landscape fragmentation and forest fuel accumulation: effects of fragment size, age, and climate | William Gould | IITF_COOP@upr.edu |
| 01-1-3-40 | Incorporating spatial heterogeneity into fire restoration plans | Dean Urban | deanu@duke.edu |
| 01-1-3-43 | Fire management, and land mosaic interactions: a generic spatial model and toolkit from stand to landscape scales (01.NCS.C.1) | Thomas Crow | tcrow@fs.fed.us |
| 01-1-7-02 | Photo series for major natural fuel types of the United States—phase III (01.PNW.C.1) | Roger Ottmar | rottmar@fs.fed.us |
| 01-3-3-32 * | Changes in fire regimes and the successional status of Table Mountain pine (<i>Pinus pungens</i> Lamb.) in the southern Appalachians | Henri Grissino-Mayer | grissino@utk.edu |

Planning and Preparedness

| | | | |
|-----------|--|---------------------|----------------------|
| 98-1-5-03 | Characterizing historical and contemporary fire regimes in the Lake States (01.NCS.A.2) | David Cleland | dcleland@fs.fed.us |
| 98-1-8-02 | Fire modeling for fuel and smoke assessment | Pat Andrews | pandrews@fs.fed.us |
| 98-1-8-03 | A national fire effects prediction model | Elizabeth Reinhardt | ereinhardt@fs.fed.us |
| 98-1-9-06 | Modification and validation of fuel consumption models for shrub and forested lands in the Southwest, Pacific Northwest, Rocky Mountains, Midwest, Southeast, and Alaska (01.PNW.A.1, 01.PNW.A.4) | Roger Ottmar | rottmar@fs.fed.us |
| 98-S-1 | Proposal for completion of the Rainbow Series | Kevin Ryan | kryan@fs.fed.us |
| 99-S-1 | A national study of the consequences of fire and fire-surrogate treatments (01.PNW.B.1, 01.RMS.B.1, 01.RMS.B.4, 01.NES.C.1, 01.PNW.C.2, 01.RMS.C.5, 01.SRS.C.2, 01.SRS.C.3) | Jim McIver | jmciver@fs.fed.us |

Appendix B

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|---|------------------------|------------------------|
| 99-1-3-10 | Incorporation of wildland fuels information into landscape-scale land use and planning processes | Phil Omi | phil@cnr.colostate.edu |
| 99-1-3-16 | Wildland fuels management: evaluating and planning risks and benefits | Peter Landres | plandres@fs.fed.us |
| 99-1-3-28 * | Spatial and temporal analysis of lightning and fire occurrence in Rocky Mountain wilderness areas | Matt Rollins | mrollins@fs.fed.us |
| 00-1-1-06 | Development and implementation of a system for prediction of fire-induced shrub and tree mortality | Bret Butler | bbutler03@fs.fed.us |
| 01-1-6-07 | Assessing the value of mesoscale models in predicting fire danger (01.PNW.A.1) | Sue Ferguson | sferguson@fs.fed.us |
| 01-1-6-08 | Predicting lightning risk (01.PNW.A.1) | Sue Ferguson | sferguson@fs.fed.us |
| 01-1-7-03 | Using the NED decision-support system to improve fuels management decision processes | Michael Rauscher | mrauscher@fs.fed.us |
| 01-1-7-06 | Techniques for creating a national interagency process for predicting preparedness levels (01.PSW.A.2) | Gerry Day | gerry_day@or.blm.gov |
| 01-1-7-07 | Fire and fuels extension to the Forest Vegetation Simulator: completion of calibration for Eastern forests, provisions for user training, and program maintenance | Gary Dixon | gdixon01@fs.fed.us |
| 01-1-7-14 | Decision-support methods for prescribed fire | Donald MacGregor | donalddm@epud.net |

Air Quality, Smoke Management, and Climate

| | | | |
|-------------|---|---------------------|-------------------------|
| 98-1-8-01 * | Development, sensitivity testing, and retrospective application of the Fire Effects Tradeoff Model (FETM) | Jim Russell | jrussell01@fs.fed.us |
| 98-1-4-14 * | Ventilation Climate Information System (assessing values of air quality and visibility at risk from wildland fires) | Sue Ferguson, | sferguson@fs.fed.us |
| 98-1-9-01 | Smoke produced from residual combustion | Wei Min Hao | whao@fs.fed.us |
| 98-1-9-03 * | Technically Advanced Smoke Evaluation Tools (TASET): needs assessment and feasibility investigation | Al Riebau | ariebau@fs.fed.us |
| 98-1-9-05 | Implementation of an improved emission production model (01.PNW.A.1, 01.PNW.A.2) | David Sandberg | dsandberg@fs.fed.us |
| 01-1-5-01 | Fire effects on regional air quality including visibility | William Malm | malm@cira.colostate.edu |
| 01-1-5-03 | Automated forecasting of smoke dispersion and air quality by using NASA terra and aqua satellite data (01.RMS.A.2, 02.RMS.A.2) | Wei Min Hao | whao@fs.fed.us |
| 01-1-5-06 | Improving model estimates of smoke contributions to regional haze by using low-cost sampler systems (02.PSW.A.1) | Andrezj Bytnerowicz | abytnerowicz@fs.fed.us |
| 01-1-6-01 | Fire and climatic variability in the inland Pacific Northwest: integrating science and management (01.PNW.A.2, 01.PNW.C.2) | David Peterson | peterson@fs.fed.us |
| 01-1-6-05 | Climatic controls of fire in the Western United States: from atmospheres to ecosystems | Steven Hostetler | steve@ucar.edu |

Social and Economic Impacts

| | | | |
|-----------|--|------------------------|--------------------------|
| 98-S-3 * | Ecological and economic consequences of the 1998 Florida wildfires | Sue Grace | sue_grace@fws.gov |
| 98-S-4 * | Study of Florida residents regarding three alternative fuel treatment programs | Armando Gonzalez-Caban | agonzalezcaban@fs.fed.us |
| 99-1-1-01 | Assessing the need, costs, and potential benefits of prescribed fire and mechanical treatments to reduce fire hazard | Jamie Barbour | jbarbour01@fs.fed.us |
| 99-1-1-05 | Integrated fuels treatment assessment: ecological, economic, and financial impacts | Hayley Hesseln | haley@forestry.umn.edu |
| 99-1-2-08 | Evaluating public response to wildland fuels management: factors that influence acceptance of practices and decision processes (01.NCS.D.1, 02.NCS.D.1) | Bruce Shindler | bruce.shindler@orst.edu |

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|--|------------------------------------|-----------------------|
| 99-1-2-10 | Demographic and geographic approaches to predicting public acceptance of fuel management at the wildland-urban interface (01.NCS.D.1, 01.PSW.D.1, 02.NCS.D.1) | Jeremy Fried | jeremy_fried@s.fed.us |
| 01-1-2-09 | A national study of the economic impacts of biomass removals to mitigate wildfire damages on federal, state, and private lands (01.SRS.A.2, 01.SRS.D.1) | Jeffrey Prestemon Karen Lee Abt | jprestemon@fs.fed.us |
| 01-1-3-30 | A social assessment of public knowledge, attitudes, and values related to wildland fire, fire risk, and fire recovery | Ken Cordell | kcordell@fs.fed.us |

Fire and Invasive Plant Species

| | | | |
|-----------|--|----------------|------------------------|
| 00-1-2-01 | Spatial interactions among fuels, wildfire, and invasive plants | Phil Omi | phil@cnr.colostate.edu |
| 00-1-2-04 | Fire and invasive annual grasses in Western ecosystems | Matt Brooks | matt_brooks@usgs.gov |
| 00-1-2-06 | Fire management options to control woody invasive plants in the Northeastern and the Mid-Atlantic United States | Alison Dibble | adibble@fs.fed.us |
| 00-1-2-09 | Invasive plant and fire interactions: use of the Fire Effects Information System to provide information for managers | Kevin Ryan | kryan@fs.fed.us |
| 01-S-05 | Fire and invasive plants publication | David Brownlie | dave_brownlie@fws.gov |

Remote Sensing

| | | | |
|------------|---|----------------------|-----------------------------|
| 00-1-3-01 | The use of Landsat 7 (ETM+) and AVIRIS data to map fuel characteristic classes in Western ecosystems | Jan Van Wagtendonk | jan_van_wagtendonk@usgs.gov |
| 00-1-3-05 | Testing an approach to improving fire fuel mapping by mapping and modeling vegetation structure and types based on combined field data | Zhiliang Zhu | zhu@usgs.gov |
| 00-1-3-19 | Monitoring fire effects at multiple scales: integrating standardized field data collection with remote sensing to assess fire effects (01.RMS.A.4) | Robert Keane | rkeane@fs.fed.us |
| 00-1-3-21 | Validation of crown fuel amount and configuration measured by multispectral fusion of remote sensors | Jo Ann Fites-Kaufman | jfites@fs.fed.us |
| 01-S-01 | Development of a landscape fire analysis center | Lloyd Queen | lpqueen@ntsg.umt.edu |
| 01-1-4-02 | Fuel classification for the southern Appalachian Mountains by using hyperspectral image analysis and landscape ecosystem classification (01.SRS.C.2) | Tom Waldrop | twaldrop@fs.fed.us |
| 01-1-4-07 | The use of high-resolution remotely sensed data in estimating crown fire behavior variables | Gerard Schreuder | gsch@u.washington.edu |
| 01-1-4-09 | A novel approach to regional fuel mapping: linking inventory plots with satellite imagery and GIS databases by using the gradient nearest neighbor method | Janet Ohman | johmann@fs.fed.us |
| 01-1-4-12 | Evaluate sensitivities of burn-severity mapping algorithms for different ecosystems and fire histories in the United States | Zhiliang Zhu | zhu@usgs.gov |
| 01-1-4-14 | Advanced remote sensing technologies for monitoring postburn vegetation trends and conditions | Ralph Root | ralph_root@usgs.gov |
| 01-1-4-15 | Mapping horizontal and vertical distribution of fuel by fusing high-resolution hyperspectral and polarimetric data | Don Despain | ddespain@montana.edu |
| 01-1-4-23 | Quantitative comparison of spectral indices and transformations with multiresolution remotely sensed data by using ground measurements: implications for fire-severity modeling | Jennifer Rechel | jrechel@fs.fed.us |
| 01B-2-1-01 | Field measurements for the training and validation of burn-severity maps from spaceborne, remotely sensed imagery | Thomas Bobbe | tbobbe@fs.fed.us |
| 01C-2-1-02 | Evaluating high-resolution hyperspectral images | Pete Robichaud | probichaud@fs.fed.us |
| 01C-2-1-08 | Real-time evaluation of effects of fuel treatments and other previous land management activities on fire behavior during wildfires | Jo Ann Fites-Kaufman | jfites@fs.fed.us |

Appendix B

| Project ID number | Project title | Principal investigator | E-mail address |
|--|---|------------------------|---------------------------|
| Demonstration Sites, Administrative Studies, and Local Needs Projects | | | |
| 00-2-02 | Fire hazard reduction in chaparral by using diverse treatments | James Dawson | jdawson@ca.blm.gov |
| 00-2-04 | Integrating fuel and forest management: developing prescriptions for the central hardwood region | Edward Lowenstein | eloewensein@fs.fed.us |
| 00-2-05 | Kings River and Lake Tahoe Basin demonstration sites for fuel treatments (01.PSW.C.1) | Carolyn Hunsaker | chunsaker@fs.fed.us |
| 00-2-06 | Conversion of upland loblolly pine-hardwood stands to longleaf pine | James Haywood | dhaywood@fs.fed.us |
| 00-2-13 | A comparison of silvicultural practices for controlling mountain laurel in the mixed-oak forests of Pennsylvania | Patrick Brose | rbrose@fs.fed.us |
| 00-2-15 | A demonstration area on ecosystem response to watershed-scale burns in Great Basin pinyon-juniper woodlands (01.RMS.B.5) | Jeanne Chambers | jchambers@fs.fed.us |
| 00-2-19 | Stand and fuel treatments for restoring old-growth ponderosa pine forests in the interior West (Boise Basin Experimental Forest) (01.RMS.C.2) | Russel Graham | rtgraham@fs.fed.us |
| 00-2-20 | Treatments that enhance the decomposition of forest fuels for use in partially harvested stands in the moist forests of the Northern Rocky Mountains (Priest River Experimental Forest) (01.RMS.C.2) | Russel Graham | rtgraham@fs.fed.us |
| 00-2-23 | Managing fuels and forest structure in the southern boreal forest on Minnesota's national forests | John Zasada | jzasada@fs.fed.us |
| 00-2-25 | Demonstration plots for comparing fuel complexes and profile development in untreated stands versus stands treated for the management of spruce beetle outbreaks and implications for fuels manipulation | Elizabeth Hebertson | lgherbertson@fs.fed.us |
| 00-2-27 | Maintaining longleaf pine woodlands: Is mechanical shearing a surrogate for prescribed burning? (01.SRS.C.5) | Jeff Glitzenstein | bluestemjeff@netscape.net |
| 00-2-29 | Fire application to saltcedar-dominated riparian areas: ecosystem response, prescription development, and hazardous fuels reduction | Brent Racher | racher@caprock-spur.com |
| 00-2-30 | Fire hazard reduction in ponderosa pine plantations | John Swanson | jrswanson@fs.fed.us |
| 00-2-31 | Restoring mixed-conifer ecosystems to prefire suppression conditions in Crater Lake National Park | Mark Huff | mhhuff@fs.fed.us |
| 00-2-32 | Control of invasive annual grasses in the Mojave Desert | Matt Brooks | matt_brooks@usgs.gov |
| 00-2-33 | The Lick Creek demonstration of forest renewal through partial harvest and fire | Benjamin Zamora | bzamora@mail.wsu.edu |
| 00-2-34 | Fuels treatment demonstration sites in the boreal forests of interior Alaska | Robert Ott | rott@tanachiefs.org |
| 00-2-35 | Evaluation of three fuel management treatments for eastern white pine | James Cook | jcook@uwsp.edu |
| 01-3-1-05 | Demonstrating the ecological effects of mechanical thinning and prescribed fire on mixed-conifer forests | Malcolm North | mnorth@fs.fed.us |
| 01-3-1-06 | Two demonstration sites in northern Arizona for forest thinning, fire use, and fire surrogate treatments in the ponderosa pine type | Edward Smith | ebsmith@flagstaff.az.us |
| 01-3-2-02 | Tree regeneration response to fire restoration in mixed-conifer forest | Andrew Gray | agray01@fs.fed.us |
| 01-3-2-03 | Prescribed fires in Mid-Atlantic coastal plain forests | Oliver Pattee | Hank_Pattee@usgs.gov |
| 01-3-2-08 | Risk assessment of fuel management practices on hillslope erosion processes (phase II) (01.PSW.B.1, 02.RMS.C.1) | Peter Robichaud | probichaud@fs.fed.us |
| 01-3-2-09 | Prescribed fire for fuel reduction in northern mixed-grass prairie: influence on habitat and population dynamics of indigenous wildlife | Robert Murphy | bob_murphy@fws.gov |

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|---|------------------------|-----------------------------|
| 01-3-2-12 | Weed invasions following fire in southwestern Colorado: long-term effectiveness of mitigation treatments and future predictions | Lisa Floyd-Hanna | lfloyd-hanna@prescott.edu |
| 01-3-2-14 | Effects of prescribed grazing and burning treatments on fire regimes in alien grass-dominated wildland-urban interface areas, Leeward, Hawaii | Michael Castillo | mick_Castillo@fws.gov |
| 01-3-3-12 | Identifying reference conditions for prescribed fire management of mixed-conifer forests in Yosemite National Park, California | Kara Paintner | kara_paintner@nps.gov |
| 01-3-3-13 | Fire and forest structure across vegetation gradients in San Juan National Forest, Colorado: a multiscaled historical analysis | Peter Brown | pmb@rmtrr.org |
| 01-3-3-14 | Fire and oak regeneration in the southern Appalachians | David Loftis | dloftis@fs.fed.us |
| 01-3-3-18 | Evaluating the effects of prescribed fire and fuels treatment on water quality and aquatic habitat | Caty Clifton | cclifton@fs.fed.us |
| 01-3-3-20 | Experimental studies of the role of fire in restoring and maintaining arid grasslands | Carl Edminster | cedminster@fs.fed.us |
| 01-3-3-27 | Jeffrey pine-mixed conifer fire history and forest structure with and without fire suppression and harvesting | Carl Skinner | cskinner@fs.fed.us |
| 01-3-3-29 | Assessing anthropogenic changes in fire regimes by using relict areas in El Malpais National Monument, New Mexico | Henri Grissino-Mayer | grissino@etk.edu |
| 01-3-3-30 | Including fire effects information in a manual of California vegetation | Michael McCoy | mcmccoy@ucdavis.edu |
| 01-3-3-32 | Changes in fire regimes and the successional status of Table Mountain pine (<i>Pinus pungens</i> Lamb.) in the southern Appalachians | Henri Grissino-Mayer | grissino@etk.edu |
| 01-3-3-33 | Predicting the invasion and survival of the exotic species <i>Paulownia tomentosa</i> following burning in pine and oak-pine forests | Michael Jenkins | mike_jenkins@nps.gov |
| 01-3-3-34 | Effects of fire on biological soil crusts and their subsequent recovery at the Great Basin Pinyon-Juniper Demonstration Area | Steven Warren | swarren@cemml.colostate.edu |
| 01B-3-1-01 | The Flomaton Natural Area: demonstrating the benefits of fuel management and the risks of fire exclusion in an old-growth longleaf pine ecosystem | John Kush | kushjoh@auburn.edu |
| 01B-3-1-03 | Dormant-season prescription fires to reduce hazardous fuel loads on the South Carolina coastal plain: establishing a demonstration area on a 40+ year study | Ken Outcalt | koutcalt@fs.fed.us |
| 01B-3-1-04 | Long-term dormant-season burning interval study in the Palmetto/Gallberry fuel complex: establishing an adjacent growing-season burn study and making both demonstration areas | Ken Outcalt | koutcalt@fs.fed.us |
| 01B-3-1-05 | Frequency and season of prescription fires to reduce hazardous fuel loads on the lower Piedmont of Georgia: establishing a demonstration area on a 12-year-old study | Ken Outcalt | koutcalt@fs.fed.us |
| 01B-3-1-06 | Frequency and season of prescription fires to reduce hazardous fuel loads | Ken Outcalt | koutcalt@fs.fed.us |
| 01B-3-2-01 | Impacts of prescribed burning on the survival of Douglas-fir and ponderosa pine in the Boise National Forest | Robert Progar | rprogar@fs.fed.us |
| 01B-3-2-07 | Management of fuel loading in the shrub-steppe | Steven Link | slink@tricity.wsu.edu |
| 01B-3-2-08 | Prefire fuel manipulation impacts on alien plant invasion of wildlands | Jon Keeley | jon_keeley@usgs.gov |
| 01B-3-2-10 | Determining the ecological effects of fire suppression, fuels treatment, and wildfire through bird monitoring in the Klamath ecoregion of southern Oregon and northern California | John Alexander | jda@klamathbird.org |
| 01B-3-2-11 | Using cattle as fuel reduction and seeding agents in annual and perennial grass stands in the Great Basin | Christopher Call | cacall@cc.usu.edu |
| 01B-3-3-01 | Effects of fire and rehabilitation seeding on sage grouse habitat in the pinyon-juniper zone (01.RMS.B.5) | Jeanne Chambers | jchambers@fs.fed.us |

Appendix B

| Project ID number | Project title | Principal investigator | E-mail address |
|-------------------|---|--|-------------------------|
| 01B-3-3-03 | Effects of prescribed fire on the invasion of northern mixed-grass prairie by nonnative plant species: implications for restoration of an endangered ecosystem | Fred Giese | fred_giese@fws.gov |
| 01B-3-3-05 | Fuel reduction effects on a key Sierra food web | Malcolm North | mnorth@ucdavis.edu |
| 01B-3-3-06 | Interactions of burn season and ecological condition on ecosystem response to fire in the mountain big sagebrush communities: information necessary for restoration and postfire rehabilitation | Boone Kauffman | boone.kauffman@ost.edu |
| 01B-3-3-13 | Quantification of fuel in <i>Baccharis</i> (coyote bush) shrub types: assessing fuel loading by using destructive and non-destructive methods | Will Russell | wrussell@usgs.gov |
| 01B-3-3-15 | Integrating prescribed fire into management of mixed-oak forests of the Mid-Atlantic region: developing basic fire behavior and fuels information for the SILVAH system | Patrick Brose | pbrose@fs.fed.us |
| 01B-3-3-16 | Effects of season and interval of prescribed burns in a ponderosa pine ecosystem (01.PNW.B.1) | Walter Thies | wthies@fs.fed.us |
| 01B-3-3-18 | Fire regimes of forests in the peninsular and transverse ranges of southern California | Carl Skinner | cskinner@fs.fed.us |
| 01B-3-3-24 | Development of a methodology for building long-term fire history in Great Basin valley landscapes | Pat Barker | jbarker@nv.blm.gov |
| 01B-3-3-26 | Fire knowledge for managing Cascadian whitebark pine forests | Michael Murray | michael.murray@orst.edu |
| 01B-3-3-27 | Fuels management and nonnative plant species: an evaluation of fire and fire-surrogate treatments in chaparral plant community | Tim Bradley | tim_bradley@nps.gov |
| 01B-3-3-28 | Fire effects on rare flora and fauna in southern California national forests | Jan Beyers | jbeyers@fs.fed.us |
| 01C-3-1-02 | Armells Creek prescribed fire demonstration project | Clayton Marlow | cmarlow@montana.edu |
| 01C-3-1-05 | Managing fuels in northeastern Barrens | David Crary | David_crary@nps.gov |
| 01C-3-3-01 | An integrated assessment of the historical role and contemporary uses of prescribed fire in southern Appalachian ecosystems | James Vose | jvose@fs.fed.us |
| 01C-3-3-02 | Implications of fire and fire-surrogate treatments on fisher habitat in the Sierra Nevada | Richard Truex | rtruex@fs.fed.us |
| 01C-3-3-09 | Fire regimes and successional dynamics of yellow pine stands in the central Appalachian Mountains | Henri Grissino Mayer / Elaine Sutherland | grissino@etk.edu |
| 01C-3-3-13 | Effectiveness of alien and native seed mixes in reducing cheatgrass growth and reproduction | Matt Brooks | matt_brooks@usgs.gov |

Workshops and Symposia

| | | | |
|-------------|--|-------------------------------|---------------------------|
| 98-1-1-07 * | Mapping fuels by using remote sensing and biophysical modeling (01.RMS.A.4) | Greg Gollberg, Univ. of Idaho | goll9151@uidaho.edu |
| 01-S-02 * | 4th symposium on fire and forest meteorology | Sue Ferguson | sferguson@fs.fed.us |
| 01-S-03 * | Fire and climate 2001 workshop | Francis Fujioka | ffujioka@fs.fed.us |
| 01-S-04 * | Climate variability and associated wildfire implications | Jim Brenner | brennej@doacs.state.fl.us |
| 01-U-02 * | Workshop on fire and climate history in western North and South America | Tom Swetnam | tswetnam@ltrr.arizona.edu |
| 02-S-02 | Fire in the West: a climate fuels assessment symposium | Tom Swetnam | tswetnam@ltrr.arizona.edu |
| 02-S-03 | Symposium, fire and invasive plant ecology | Matt Brooks | matt_brooks@usgs.gov |

Other Projects

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|-----------|----------------------------------|---------------|------------------------|
| 02-S-01 * | Administrative database for JFSP | Carol Simmons | csimmons@colostate.edu |
|-----------|----------------------------------|---------------|------------------------|

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